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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,502	04/16/2004	Sharon M. Weiss	176/61511 (2-11144-03043)	2198

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EXAMINER	
BLEVINS, JERRY M	

ART UNIT	PAPER NUMBER
2883	

DATE MAILED: 10/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/826,502	WEISS ET AL.	
	Examiner	Art Unit	
	Jerry Martin Blevins	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-16 and 18-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *6,15 and 25* is/are allowed.

6)☒ Claim(s) *1-5,7,9-14,16,18-24 and 26-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Brian Healy
Primary Examiner

DETAILED ACTION

Response to Arguments

Applicant's arguments filed July 19, 2006 have been fully considered but they are not persuasive.

Namely, although the applied prior art reference to Chan et al., US 2002/0192680 does not expressly teach that that the heating specifically involves an annealing process, Chan does teach a rather slow process of heating (over a 10 minute span, paragraph 76, page 7). After the heating process of Chan is complete, the device is allowed to cool (by the mere exclusion of maintaining heat). Presumably, the cooling process would likewise be a slow process, since Chan gives no hint at cooling in any method other than simply removing the heat. This process of heating followed by slow Cooling is essentially the same as the presently claimed "annealing". In order for a heating process to specifically not involve a process of annealing, either 1) the heating must be applied continuously, such that no cooling is allowed, 2) there must exist some external cooling agent that more rapidly cools the structure such that the cooling is not the slow cooling associated with annealing, or 3) there must be some explicit mentioning that the heating process does not involve annealing. The process of Chan fails each of these criteria, as 1) the heat is applied for 10 minutes only, thus necessitating cooling once the heat is removed, 2) there is no external cooling agent, so the cooling must take place slowly, and 3) there is no explicit denial of annealing.

Therefore, examiner maintains that the annealing process of the claimed invention is an obvious variant over the explicitly stated heating process of Chan.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5, 7, 9-14, 16, 18-24, and 26-28 rejected under 35 U.S.C. 103(a) as being unpatentable over Chan.

Regarding independent claims 1 and 10, Chan teaches a method and system for controlling one or more temperature dependent properties (namely reflectance spectra, paragraph 58, page 5) of a structure (a photonic band-gap microcavity, paragraph 58, page 5), the method and system comprising: heating (with a heating system that heats) at least a portion of a photonic band-gap structure (paragraph 76, page 7, wherein the photonic band-gap structure is silicon layers of a microcavity), and oxidizing (with an oxidizing system that oxidizes) the at least a portion of the photonic band-gap structure during the heating (paragraph 76, page 7) to alter at least one temperature dependent optical property of the photonic band-gap structure (paragraph 58, page 5). Chan does not expressly teach that that the heating (with a heating system that heats) comprises annealing the at least a portion of the photonic band-gap structure. However, Chan does teach a rather slow process of heating (over a 10 minute span, paragraph 76,

page 7). After the heating process of Chan is complete, the device is allowed to cool (by the mere exclusion of maintaining heat). Presumably, the cooling process would likewise be a slow process, since Chan gives no hint at cooling in any method other than simply removing the heat. Therefore, this rather slow process of heating and cooling may reasonably referred to as an annealing process. It would have been obvious to one of ordinary skill in the art at the time of the invention to anneal the at least a portion of the photonic band-gap structure of Chan. The motivation would have been to strengthen the oxide structure.

Regarding independent claim 19, Chan teaches a photonic band-gap device (Figure 1) comprising: two or more first silicon layers; and two or more second silicon layers, wherein each of the first silicon layers adjacent one of the second silicon layers forms a period and wherein each of the second silicon layers has a higher porosity than the adjacent first silicon layer (page 3, paragraph 34); wherein two or more of the periods adjacent each other form a stack (stacks 10 including upper stack 12 and lower stack 14), wherein the stack is heated and oxidized (paragraph 76, page 7) to alter at least one temperature dependent optical property of the stack (namely reflectance spectra, paragraph 58, page 5). Chan does not expressly teach that that the heating comprises annealing the at least a portion of the photonic band-gap structure. However, Chan does teach a rather slow process of heating (over a 10 minute span, paragraph 76, page 7). After the heating process of Chan is complete, the device is allowed to cool (by the mere exclusion of maintaining heat). Presumably, the cooling process would likewise be a slow process, since Chan gives no hint at cooling in any

method other than simply removing the heat. Therefore, this rather slow process of heating and cooling may reasonably referred to as an annealing process. It would have been obvious to one of ordinary skill in the art at the time of the invention to anneal the at least a portion of the photonic band-gap structure of Chan. The motivation would have been to strengthen the oxide structure.

Regarding claims 2, 11, and 20, Chan renders obvious the limitations of the base claims 1, 10, and 19, respectively. Although Chan does not explicitly teach that the temperature dependent optical property of the photonic band-gap structure is made to be substantially insensitive to temperature changes, the temperature dependent optical property of Chan is the same as the temperature dependent optical property of the applicants' invention, namely reflectance spectra (paragraph 58, page 5). In addition, the structure of Chan and the heating and oxidizing method of Chan are the same as those presented by applicants. Therefore, the substantial temperature insensitivity of the temperature dependent optical property is inherently present in the teachings of Chan.

Regarding claims 3 and 12, Chan renders obvious the limitations of the base claims 1 and 10, respectively. Chan also teaches that the photonic band-gap structure is a microcavity (paragraph 58, page 5).

Regarding claims 4 and 13, Chan renders obvious the limitations of the base claims 3 and 12, respectively. Chan also teaches that the microcavity comprises two Bragg mirrors (Figure 1, elements 12, 14, paragraph 13, pages 1 and 2) separated by at least one defect layer (element 16 and paragraph 39, page 3)

Regarding claims 5, 14, and 24, Chan renders obvious the limitations of the base claims 2, 11, and 20, respectively. Chan also teaches that the property is a reflectance spectra of the photonic band-gap structure (paragraph 58, page 5).

Regarding claims 7, 16, and 27, Chan renders obvious the limitations of the base claims 1, 10, and 19, respectively. Chan also teaches that the oxidizing (with the oxidizing system that oxidizes) further comprises oxidizing the photonic band-gap structure in oxygen (paragraph 76, page 7). Chan does not specifically teach at least one atmosphere of oxygen. However, one atmosphere of a gas is the standard atmospheric pressure. Chan does teach that the oxygen used for oxidation is streaming (paragraph 76, page 7). This would necessitate that the oxygen be pressurized to some pressure greater than one atmosphere. Therefore, Chan indirectly teaches at least one atmosphere of oxygen.

Regarding claims 9, 18, and 28, Chan renders obvious the limitations of the base claims 1,10, and 19, respectively. Chan also teaches that the heating further comprises heating the photonic band-gap device to a temperature of at least 300 degrees Celsius (namely 900 degrees Celsius, paragraph 76, page 7).

Regarding claim 21, renders obvious the limitations of the base claim 19. Chan also teaches at least one defect (Figure 1, element 16) between a pair of stacks (12, 14) with the defect layer and the stacks joined together.

Regarding claim 22, Chan renders obvious the limitations of the base claim 21. Chan does not expressly teach that each stack has about a quarter wavelength optical thickness. Chan does teach that each high porosity layer has a thickness of 160 nm

while each low porosity layer has a thickness of 80 nm (paragraph 39, page 3). This teaching would lead to a stack with a minimum thickness of 480 nm. Chan also teaches that wavelengths in the range of 800 nm to 3000 nm (infrared) are acceptable (paragraph 28, pages 2 and 3), which would include a wavelength 4 times that of the stack thickness. Furthermore, Chan teaches that the thickness of the stacks varies with the desired wavelength (paragraph 31, page 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Chan such that each stack has about a quarter wavelength optical thickness, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. The motivation would have been to improve light detection (paragraph 31, page 3).

Regarding claim 23, Chan renders obvious the limitations of the base claim 21. Chan does not expressly teach that the defect layer comprises one of about a quarter wavelength optical thickness and any multiple of the about quarter wavelength optical thickness. Chan does teach that each high porosity layer has a thickness of 160 nm while each low porosity layer has a thickness of 80 nm (paragraph 39, page 3). This teaching would lead to a stack with a minimum thickness of 480 nm. Chan teaches that the entire structure has a thickness of 2400 nm (paragraph 39, page 3). This would lead to a maximum defect thickness of 1440 nm. Chan also teaches that wavelengths in the range of 800 nm to 3000 nm (infrared) are acceptable (paragraph 28, pages 2 and 3). Included in this range are wavelengths wherein the defect thickness would be two, three, four, five, six, and seven times about a quarter of the wavelength.

Furthermore, Chan teaches that the thickness of the defect varies with the desired wavelength (paragraph 31, page 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Chan such that the defect has one of about a quarter wavelength optical thickness and any multiple of about a quarter wavelength optical thickness, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. The motivation would have been to improve light detection (paragraph 31, page 3).

Regarding claim 26, Chan renders obvious the limitations of the base claim 19. Chan also teaches that one of the first and second silicon layers has a higher refractive index than the other one of the first and second silicon layers in each of the periods (as evidenced in paragraph, page 6, where Chan teaches that the index of refraction of the porous material depends on the level of porosity).

Claims 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan in view of US Patent 6,876,683 to Watanabe et al.

Regarding claims 29-31, Chan renders obvious the limitations of the base claims 1, 10, and 19, respectively. Chan does not teach that the oxidizing system oxidizes the at least a portion of the photonic band-gap structure in a mixture comprising N_2 and O_2. Watanabe teaches oxidizing in a mixture comprising N_2 and O_2 (column 5, lines 52-57). It would have been obvious to one of ordinary skill in the art at the time of the invention

to modify the oxidizing system of Chan with the mixture of Watanabe. The motivation would have been to reduce costs, since this mixture would include readily available air.

Allowable Subject Matter

Claims 6, 15, and 25 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 6, 15, and 25, Chan, alone or in combination with the prior art, fails to disclose or render obvious a maximum shift of about +/- 0.5 nm for a temperature change up to about 100 degrees Celsius.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry Martin Blevins whose telephone number is 571-272-8581. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMB

Brian Healy
Primary Examiner